New Combinations in *Tillaea* (Crassulaceae)

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ABSTRACT. On the basis of molecular data, the present authors will recognize *Crassula* L. and *Tillaea* L. as distinct genera in the forthcoming account of the Crassulaceae for the *Flora of China*, Volume 8. *Tillaea* is represented in the *Flora* area, but *Crassula* sensu stricto is not. With this arrangement, the correct name for *T. pentandra* Royle ex Edgeworth, described from the Himalayas, would be a new combination based on *Crassula schimperi* C. A. Meyer, described from Ethiopian material but clearly synonymous. The taxonomic identity of the latter name has been overlooked by authors working on Asian floras. Therefore, the new combination *T. schimperi* (C. A. Meyer) M. G. Gilbert, H. Ohba & K. T. Fu is made here along with new combinations for two subspecies found in tropical Africa and formerly treated under *Crassula*: *T. schimperi* subsp. *phyturus* (Mildbraed) M. G. Gilbert, H. Ohba & K. T. Fu and *T. schimperi* subsp. *transvalensis* (Kuntze) M. G. Gilbert, H. Ohba & K. T. Fu.

The separation of *Tillaea* L. from *Crassula* L. has been somewhat controversial. The last major revision of *Crassula* (Tölken, 1977) kept the two genera together. This has been followed by all the major African floras (Fernandes, 1983; Gilbert, 1989; Wickens, 1987) and the *Flora of Bhutan* (Grierson, 1987). More recently, however, molecular data have suggested that there is a case for keeping *Tillaea* as a genus distinct from *Crassula*. An analysis of chloroplast DNA restriction-site variation has indicated that *Tillaea* is most closely related to *Crassula*, but that the two genera exhibit a relatively high level (4.8%) of sequence divergence (Ham, 1995; Ham & 't Hart, 1998). This separation is being followed in the forthcoming account of the Crassulaceae (Fu & Ohba, in press) for the *Flora of China*, Volume 8, where *Tillaea* occurs, but not *Crassula* sensu stricto.

Most botanists working on Asian plants have used the name *Crassula pentandra* (Royle ex Edgeworth) Schönland, based on *T. pentandra* Royle ex Edgeworth (1846), which was described from Himalayan material for a widespread, often common, montane species occurring in Xizang Autonomous Region (Tibet) within the *Flora of China* area. Though it typically grows in somewhat drier habitats than most species of *Tillaea*, it is clearly referable to this genus on the basis of its inconspicuous, axillary inflorescence, in contrast to the conspicuous, terminal inflorescence of *Crassula* sensu stricto.

These workers took the view that the Asian plants are not conspecific with any material from Africa. However, Himalayan material differs in no way from *Crassula schimperi* C. A. Meyer (1842), described on the basis of material from Ethiopia. This species has never been formally treated as a species of *Tillaea*. This means that a new combination is needed to make the name available for the *Flora of China*. Three rather well-defined subspecies of *C. schimperi* have been recognized in tropical Africa, only one of which significantly extends into Asia (subsp. *schimperi*), and new combinations in *Tillaea* are made for these, too.

Tillaea schimperi (C. A. Meyer) M. G. Gilbert, H. Ohba & K. T. Fu, comb. nov. Basionym: *Crassula schimperi* C. A. Meyer, in Fischer, C. A. Meyer & Avé-Lallemant, Index Sem. Hort. Petrop. 8: 56. 1842. TYPE: cultivated in St. Petersburg, Russia, from seed collected in Ethiopia: "Semina (N. 183) in Abyssinia legit cel. Schimper" (holotype, LE not seen; isotype, K).

Tillaea schimperi subsp. **schimperi**

Tillaea pentandra Royle ex Edgeworth, Trans. Linn. Soc. London 20: 50. 1846. *Crassula pentandra* (Royle ex Edgeworth) Schönland, in Engler & Prantl, Nat. Pflanzenfam. 3(2): 37. 1891. TYPE: [NW] India. "Himalaya, Garhwal, altit. 4–6000 ped.," s.d., *Edgeworth 97* (lectotype, designated by Wickens (1982: 666), K).

Habitat. Moist, well-drained, often shaded sites on rocks, earth banks, fallen logs, often in montane forest, sometimes epiphytic; (1500–)2000–4800 m.

Distribution. Africa: Cameroon, Chad (Tibesti), Ethiopia, Kenya, Sudan, Tanzania, Uganda, Zaire, Zambia; Asia: Bhutan, China, India, Nepal, Pakistan, Yemen.

Tillaea schimperi subsp. **phyturus** (Mildbraed) M. G. Gilbert, H. Ohba & K. T. Fu, comb. nov. Basionym: *Crassula phyturus* Mildbraed, Notizbl. Bot. Gart. Berlin-Dahlem 8: 227. 1922. *Crassula pentandra* (Royle ex Edgeworth) Schönland var. *phyturus* (Mildbraed) Hedberg, Symb. Bot. Upsal. 15: 100. 1957. *Crassula schimperi* C. A. Meyer subsp. *phyturus* (Mildbraed) R. Fernandes, Bol. Soc. Brot., sér. 2, 52: 172. 1978. TYPE: Kenya. "Östl. Mt. Elgon, im Wald, 10 000 Fuß," June 1920, *G. Lindblom s.n.* (holotype, S not seen).

Habitat. Basement-complex rock outcrops, often seasonally moist but fully exposed.

Distribution. Africa: Ethiopia, Kenya, Sudan, Tanzania, Uganda; Asia: Yemen (Socotra).

Tillaea schimperi subsp. **transvalensis** (Kuntze) M. G. Gilbert, H. Ohba & K. T. Fu, comb. nov. Basionym: *Sedum transvalense* Kuntze, Rev. Gen. Pl. 3(2): 85. 1898. *Crassula transvalensis* (Kuntze) K. Schumann, Just's Bot. Jahresber. 26(1): 347. 1900. *Crassula schimperi* C. A. Meyer subsp. *transvalensis* (Kuntze) R. Fernandes, Bol. Soc. Brot., sér. 2, 52: 172. 1978. TYPE: South Africa. "Transvaal: Johannisburg," s.d., *Kuntze s.n.* (holotype, NY not seen).

Habitat. Rocky outcrops, sandy soil in grassland.

Distribution. Africa: Angola, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zimbabwe.

Fernandes (1983) maintained three varieties within this taxon, but we are reluctant to make new combinations for quadrinomials not familiar to us. The taxon is named after the Transvaal in South Africa, and subsequent authors have used this more usual spelling and rendered the epithet "*transvaalensis*," treating the original version as if it were an orthographic error. However, Kuntze used "*transval-*" for three other species in the same publication but never used "*transvaal-*," so the former spelling is obviously deliberate and cannot be treated as an error.

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